

IN THE CLAIMS

Clean version of amended claims:

Please enter the following amendments in the claims:

1. A device for determining the distance from a fixed position to a plurality of points on the surface of a target object, comprising:
 - a. a laser, positioned proximate said fixed position;
 - b. a video camera, positioned proximate said laser, and fixed in position with respect to said laser, wherein a beam projected by said laser and the field of view of said video camera lie approximately in a first plane;
 - c. an oscillating mirror, positioned proximate said laser and said video camera, wherein said oscillating mirror reflects said beam projected by said laser and said field of view of said video camera out toward said target object so that said reflected beam projected by said laser and said reflected field of view of said video camera fall upon said target object;
 - d. wherein said reflected beam projected by said laser and said reflected field of view of said video camera lie approximately in a second plane;
 - e. wherein said laser, said video camera, and said oscillating mirror are positioned and oriented so that said second plane is substantially angularly displaced from said first plane;
 - f. measurement means capable of accurately measuring the position of said impact point within said field of view of said video camera;
 - g. computation means for calculating the distance from said fixed position to said impact point on the basis of said measured position of said impact point

within said field of view of said video camera; and

h. wherein said oscillating mirror oscillates in a controlled fashion so as to sweep said beam of said laser and said field of view of said camera across said target object while maintaining said impact point within said field of view of said video camera, so as to permit the computation of distances for a plurality of said impact points on said target object.

4. A device for determining the distance from a fixed position to a plurality of points on the surface of a target object, comprising:

- a. a laser, positioned proximate said fixed position;
- b. a video camera, positioned proximate said laser, and fixed in position with respect to said laser, wherein a beam projected by said laser and the field of view of said video camera lie approximately in a first plane;
- c. a galvanometer, having an oscillating shaft extending therefrom, and being positioned proximate said laser, with said oscillating shaft being oriented to obstruct the path of said beam and said field of view of said camera;
- d. a mirror, fixedly attached to said oscillating shaft, and positioned so as to reflect said beam and said camera field of view out toward said target object, so that said reflected beam creates an impact point on said target object which falls within said reflected field of view of said camera, and so that an oscillation of said oscillating shaft causes the oscillation of said mirror, thereby causing said impact point and

said reflected camera field of view to sweep across said target object in synchronization;

- e. wherein said reflected beam and said reflected field of view of said video camera lie approximately in a second plane;
- f. wherein said laser, said video camera, and said oscillating mirror are positioned and oriented so that said second plane is substantially angularly displaced from said first plane;
- g. measurement means capable of accurately measuring the position of said impact point within said field of view of said video camera; and
- h. computation means for calculating the distance from said fixed position to said impact point on the basis of said measured position of said impact point within said field of view of said video camera.

7. A device for determining the distance from a fixed position to a plurality of points on the surface of a target object, comprising:

- a. a laser mirror;
- b. a camera mirror, offset a set separation distance from said laser mirror, and linked to said laser mirror so as to move in unison with said laser mirror;
- c. a laser, positioned so as to direct a beam upon said laser mirror and from thence a reflected beam out to said target object;
- d. a camera, positioned so that the field of view of said camera falls upon said camera

mirror and the reflected field of view of said camera falls upon said target object ;

- e. wherein said beam from said laser and said field of view of said camera lie approximately in a first plane;
- f. wherein said reflected beam projected by said laser and said reflected field of view of said camera lie approximately in a second plane;
- g. wherein said laser, said camera, said laser mirror, and said camera mirror are positioned and oriented so that said second plane is substantially angularly displaced from said first plane;
- h. means for oscillating said laser mirror through a set arc, thereby moving said impact point of said beam up and down upon said target object, and also moving said camera mirror in unison with said laser mirror so that said impact point is always within the field of view of said camera;
- i. means for measuring the position of said impact point within said field of view of said camera; and
- j. computation means for calculating the distance from said shaft to said impact point using said set separation distance and said position of said impact point within said field of view of said camera.

10. A device for determining the distance from a fixed position to a plurality of points on the surface of a target object, comprising:

- a. a common mirror;
- b. a laser, positioned so as to direct a beam upon said common mirror and from thence a reflected beam out to said target object

- c. a camera, offset a set distance from said laser, and positioned so that the field of view of said camera falls upon said common mirror and the reflected field of view of said camera falls upon said target object ;
- d. wherein said beam from said laser and said field of view of said camera lie approximately in a first plane;
- e. wherein said reflected beam projected by said laser and said reflected field of view of said camera lie approximately in a second plane;
- f. wherein said laser, said camera, and said common mirror are positioned and oriented so that said second plane is substantially angularly displaced from said first plane;
- g. means for oscillating said common mirror through a set arc, thereby moving said impact point of said beam up and down upon said target object, and also moving the field of view of said camera in unison with said impact point so that said impact point is always within said field of view of said camera;
- h. means for measuring the position of said impact point within said field of view of said camera; and
- i. computation means for calculating the distance from said shaft to said impact point using said set separation distance and said position of said impact point within said field of view of said camera.

11. A device for determining the distance from a fixed position to a plurality of points on the surface of a target object, comprising:

- a. a common mirror;

- b. a splitting mirror, having a first angled side and a second angled side;
- c. a projector mirror, offset a set distance from said first angled side of said splitting mirror;
- d. a receiver mirror, offset a set distance from said second angled side of said splitting mirror;
- e. a laser, positioned so as to project a beam upon said common mirror and from thence a first reflected beam upon said first angled side of said splitting mirror, and from thence a second reflected beam upon said projector mirror, and from thence a third reflected beam out to said target object
- f. a camera, offset a set distance from said laser, and positioned so that the field of view of said camera falls upon said common mirror, a first reflected field of view of said camera falls upon said second angled side of said splitting mirror, a second reflected field of view of said camera falls upon said receiver mirror, and a third reflected field of view of said camera falls upon said target object;
- g. wherein said beam from said laser and said field of view of said camera lie approximately in a first plane;
- h. wherein said first reflected beam projected by said laser and said first reflected field of view of said camera lie approximately in a second plane;
- i. wherein said laser, said camera, and said common mirror are positioned and oriented so that said second plane is substantially angularly displaced from said first plane;
- j. means for oscillating said common mirror through a set arc, thereby moving said impact point of said beam up and down upon said target object, and also moving

the field of view of said camera in unison with said impact point so that said impact point is always within said field of view of said camera;

k. means for measuring the position of said impact point within said field of view of said camera; and

l. computation means for calculating the distance from said shaft to said impact point using said set separation distance and said position of said impact point within said field of view of said camera.

Please add the following new claims:

12. A device as recited in claim 11, wherein said camera is a line scan camera.
13. A device as recited in claim 11, further comprising memory means for storing said computed distances to said impact points in order to create a surface model of said target object.
14. A device as recited in claim 11, wherein said beam projected by said laser and said camera field of view are approximately parallel.
15. A device as recited in claim 11, wherein the distance of the optical path between said camera and said common mirror is approximately equal to the distance of the optical path between said common mirror and said splitting mirror.

16. A device as recited in claim 11, wherein said camera and said laser are mounted closely together in order to minimize vibration-induced error.
17. A device as recited in claim 11, wherein said camera, said laser, and said common mirror are mounted closely together in order to minimize vibration-induced error.
18. A device as recited in claim 11, wherein said camera, said laser, said common mirror, and said splitting mirror are mounted closely together in order to minimize vibration-induced error.

Version with markings to show changes made:

Please enter the following amendments in the claims:

1. (Once amended) A device for determining the distance from a fixed position to a plurality of points on the surface of a target object, comprising:
 - a. a laser, positioned proximate said fixed position[, with its beam directed toward said target object so as to create an impact point on said target object];
 - b. a video camera, positioned proximate said laser, and fixed in position with respect to said laser, wherein a beam projected by said laser and the field of view of said video camera lie approximately in a first plane [, with the field of view of said video camera directed toward said impact point on said target object];
 - c. an oscillating mirror, positioned proximate said laser and said video camera, wherein said oscillating mirror reflects said beam projected by said laser and said field of view of said video camera out toward said target object so that said reflected beam projected by said laser and said reflected field of view of said video camera fall upon said target object;
 - d. wherein said reflected beam projected by said laser and said reflected field of view of said video camera lie approximately in a second plane;
 - e. wherein said laser, said video camera, and said oscillating mirror are positioned and oriented so that said second plane is substantially angularly displaced from said first plane;
- f.[c.] measurement means capable of accurately measuring the position of said impact point within said field of view of said video camera;
- g.[d.] computation means for calculating the distance from said fixed position to

said impact point on the basis of said measured position of said impact point within said field of view of said video camera; and

h.[e.] wherein said oscillating mirror oscillates in a controlled fashion [oscillation means for oscillating said beam and said video camera field of view in synchronization] so as to sweep said beam of said laser and said field of view of said camera across said target object while maintaining said impact point within said field of view of said video camera, so as to permit the computation of distances for a plurality of said impact points on said target object.

4. (Once amended) A device for determining the distance from a fixed position to a plurality of points on the surface of a target object, comprising:
 - a. a laser, positioned proximate said fixed position [, with its beam not directed toward said target object];
 - b. a video camera, positioned proximate said laser, and fixed in position with respect to said laser, wherein a beam projected by said laser and the field of view of said video camera lie approximately in a first plane [, with the field of view of said video camera pointed in the same direction as said beam];
 - c. a galvanometer, having an oscillating shaft extending therefrom, and being positioned proximate said laser, with said oscillating shaft being oriented to obstruct the path of said beam and said field of view of said camera;
 - d. a mirror, fixedly attached to said oscillating shaft, and positioned so as to reflect

said beam and said camera field of view out toward said target object, so that said reflected beam creates an impact point on said target object which falls within said reflected field of view of said camera, and so that an oscillation of said oscillating shaft causes the oscillation of said mirror, thereby causing said impact point and said reflected camera field of view to sweep across said target object in synchronization;

- e. wherein said reflected beam and said reflected field of view of said video camera lie approximately in a second plane;
- f. wherein said laser, said video camera, and said oscillating mirror are positioned and oriented so that said second plane is substantially angularly displaced from said first plane;
- g.[e.] measurement means capable of accurately measuring the position of said impact point within said field of view of said video camera; and
- h.[f.] computation means for calculating the distance from said fixed position to said impact point on the basis of said measured position of said impact point within said field of view of said video camera.

7. (Once amended) A device for determining the distance from a fixed position to a plurality of points on the surface of a target object, comprising:

- a. a laser mirror;
- b. a camera mirror, offset a set separation distance from said laser mirror, and linked

to said laser mirror so as to move in unison with said laser mirror;

- c. a laser, positioned so as to direct a beam upon said laser mirror and from thence a reflected beam out to said target object;
- d. a camera, positioned so that the field of view of said camera falls upon said camera mirror and the reflected field of view of said camera falls upon said target object [as to view the impact point of said beam upon said target object through its reflection in said camera mirror];
- e. wherein said beam from said laser and said field of view of said camera lie approximately in a first plane;
- f. wherein said reflected beam projected by said laser and said reflected field of view of said camera lie approximately in a second plane;
- g. wherein said laser, said camera, said laser mirror, and said camera mirror are positioned and oriented so that said second plane is substantially angularly displaced from said first plane;
- h.[e.] means for oscillating said laser mirror through a set arc, thereby moving said impact point of said beam up and down upon said target object, and also moving said camera mirror in unison with said laser mirror so that said impact point is always within the field of view of said camera;
- i.[f.] means for measuring the position of said impact point within said field of view of said camera; and
- j.[g.] computation means for calculating the distance from said shaft to said impact point using said set separation distance and said position of said impact point within said field of view of said camera.

10. (Once amended) A device for determining the distance from a fixed position to a plurality of points on the surface of a target object, comprising:

- a. a common mirror;
- b. a laser, positioned so as to direct a beam upon said common mirror and from thence a reflected beam out to said target object
- c. a camera, offset a set distance from said laser, and positioned so that the field of view of said camera falls upon said common mirror and the reflected field of view of said camera falls upon said target object [as to view the impact point of said beam upon said target object through its reflection in said common mirror];
- d. wherein said beam from said laser and said field of view of said camera lie approximately in a first plane;
- e. wherein said reflected beam projected by said laser and said reflected field of view of said camera lie approximately in a second plane;
- f. wherein said laser, said camera, and said common mirror are positioned and oriented so that said second plane is substantially angularly displaced from said first plane;
- g.[d.] means for oscillating said common mirror through a set arc, thereby moving said impact point of said beam up and down upon said target object, and also moving the field of view of said camera in unison with said impact point so that said impact point is always within said field of view of said camera;
- h.[e.] means for measuring the position of said impact point within said field of view of said camera; and
- i.[f.] computation means for calculating the distance from said shaft to said impact

point using said set separation distance and said position of said impact point within said field of view of said camera.

11. (Once amended) A device for determining the distance from a fixed position to a plurality of points on the surface of a target object, comprising:

- a. a common mirror;
- b. a splitting mirror, having a first angled side and a second angled side;
- c. a projector mirror, offset a set distance from said first angled side of said splitting mirror;
- d. a receiver mirror, offset a set distance from said second angled side of said splitting mirror;
- e. a laser, positioned so as to [direct] project a beam upon said common mirror and from thence a first reflected beam upon said first angled side of said splitting mirror, and from thence a second reflected beam upon said projector mirror, and from thence a third reflected beam out to said target object
- f. a camera, offset a set distance from said laser, and positioned so that the field of view of said camera falls upon said common mirror, a first reflected field of view of said camera falls upon said second angled side of said splitting mirror, a second reflected field of view of said camera falls upon said receiver mirror, and a third reflected field of view of said camera falls upon said target object [positioned so as to view the impact point of said beam upon said target object through its reflection in said receiver mirror, said second angled side of said splitting mirror, and said common mirror];

- g. wherein said beam from said laser and said field of view of said camera lie approximately in a first plane;
- h. wherein said first reflected beam projected by said laser and said first reflected field of view of said camera lie approximately in a second plane;
- i. wherein said laser, said camera, and said common mirror are positioned and oriented so that said second plane is substantially angularly displaced from said first plane;
- j.[g.] means for oscillating said common mirror through a set arc, thereby moving said impact point of said beam up and down upon said target object, and also moving the field of view of said camera in unison with said impact point so that said impact point is always within said field of view of said camera;
- k.[h.] means for measuring the position of said impact point within said field of view of said camera; and
- l.[i.] computation means for calculating the distance from said shaft to said impact point using said set separation distance and said position of said impact point within said field of view of said camera.

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12. A device as recited in claim 11, wherein said camera is a line scan camera.
13. A device as recited in claim 11, further comprising memory means for storing said

computed distances to said impact points in order to create a surface model of said target object.

14. A device as recited in claim 11, wherein said beam projected by said laser and said camera field of view are approximately parallel.
15. A device as recited in claim 11, wherein the distance of the optical path between said camera and said common mirror is approximately equal to the distance of the optical path between said common mirror and said splitting mirror.
16. A device as recited in claim 11, wherein said camera and said laser are mounted closely together in order to minimize vibration-induced error.
17. A device as recited in claim 11, wherein said camera, said laser, and said common mirror are mounted closely together in order to minimize vibration-induced error.
18. A device as recited in claim 11, wherein said camera, said laser, said common mirror, and said splitting mirror are mounted closely together in order to minimize vibration-induced error.